

# **New York State Severe Weather Awareness Week April 30<sup>th</sup> to May 6<sup>th</sup>, 2017**

**Severe Thunderstorms**

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NOAA's National Weather Service**

**NWS Binghamton**



# Severe Thunderstorms

**A storm which produces hail 1 inch in diameter or larger and/or wind gusts 58 mph or stronger.**



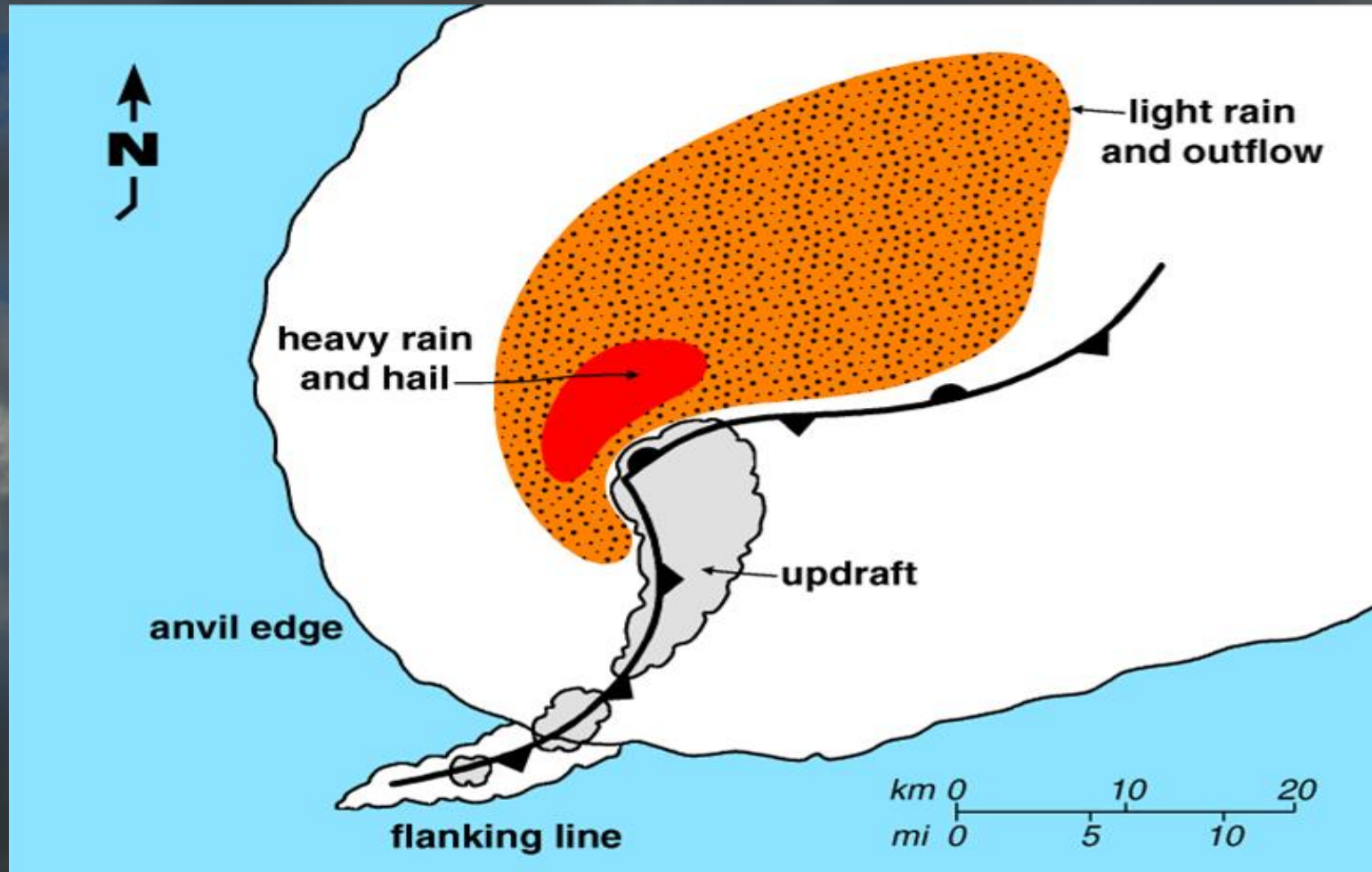
# Severe Thunderstorms Characteristics

- Persistent – long lasting
- Strong updrafts & downdrafts
- Large hail
- Strong winds
- A rotating storm
- Well organized

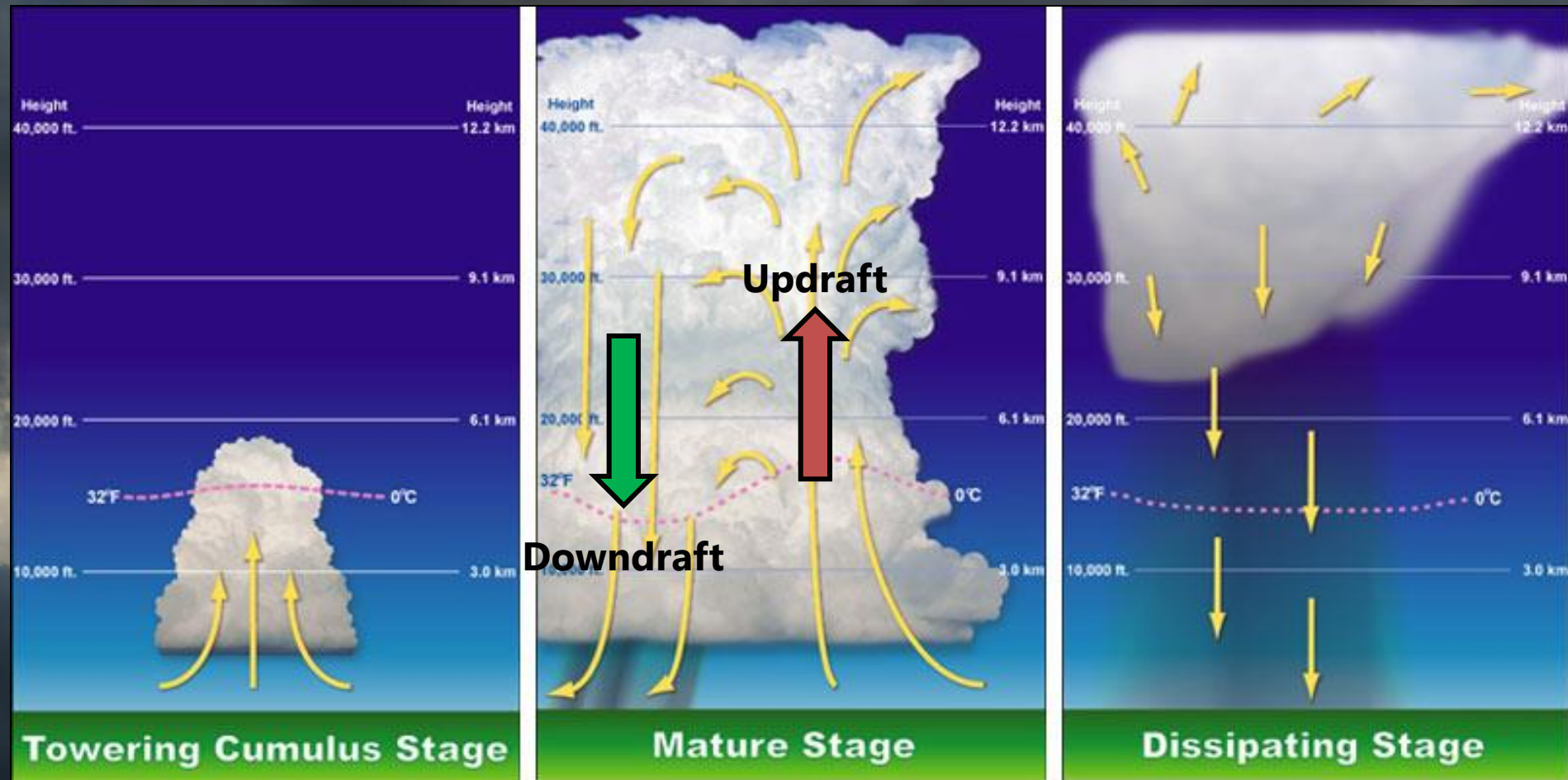




# Severe Thunderstorm Structure



# A Life Cycle of a Basic Thunderstorm



# Types of Thunderstorms

Single  
Cell

Multicell  
Cluster

Multicell  
Line

Supercell

**Weak Updraft  
(non-severe or  
Can be severe)**

**Slight Threat**

**Moderate Updraft  
(non-severe or  
Can be severe)**

**Moderate Threat**

**Moderate Updraft  
(non-severe or  
Can be severe)**

**Moderate Threat**

**Intense Updraft  
(Always severe)**

**Mesocyclone –  
Rotating Updraft**

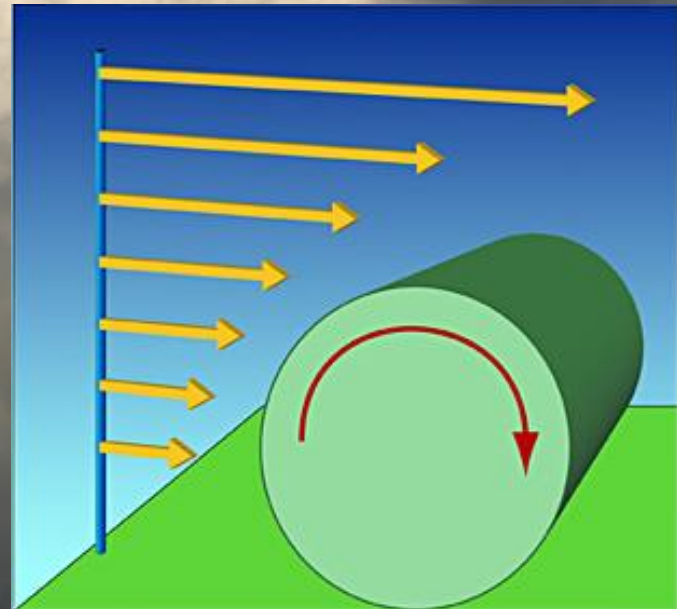
**High Threat**





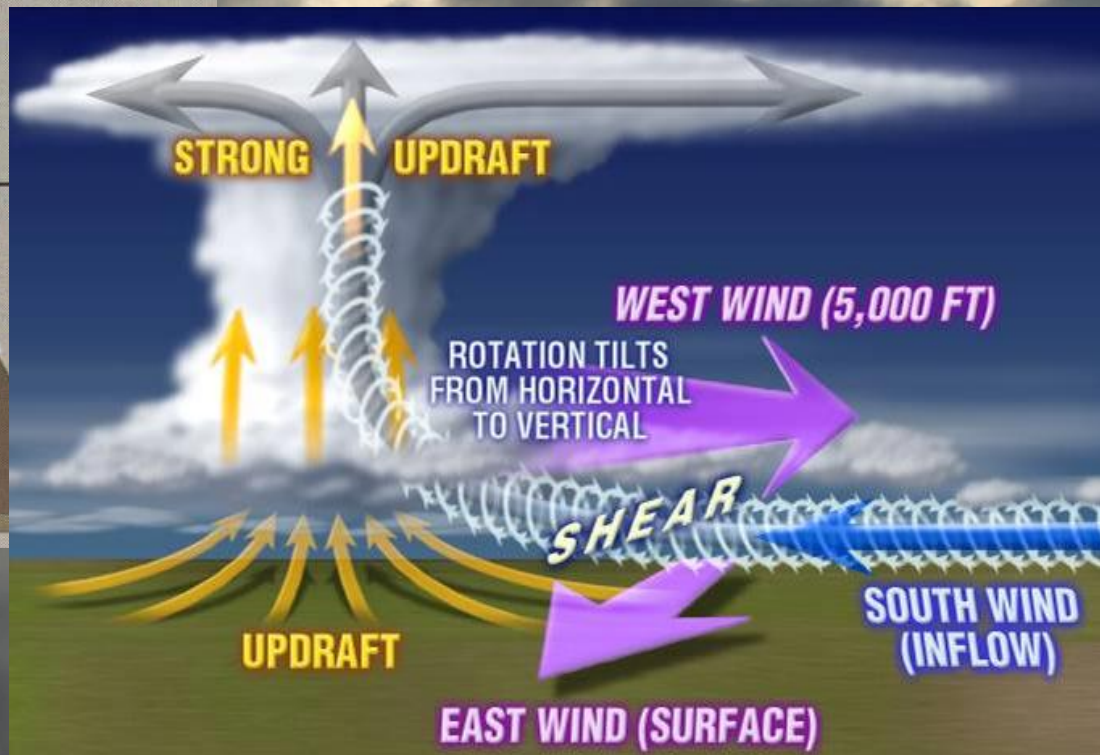
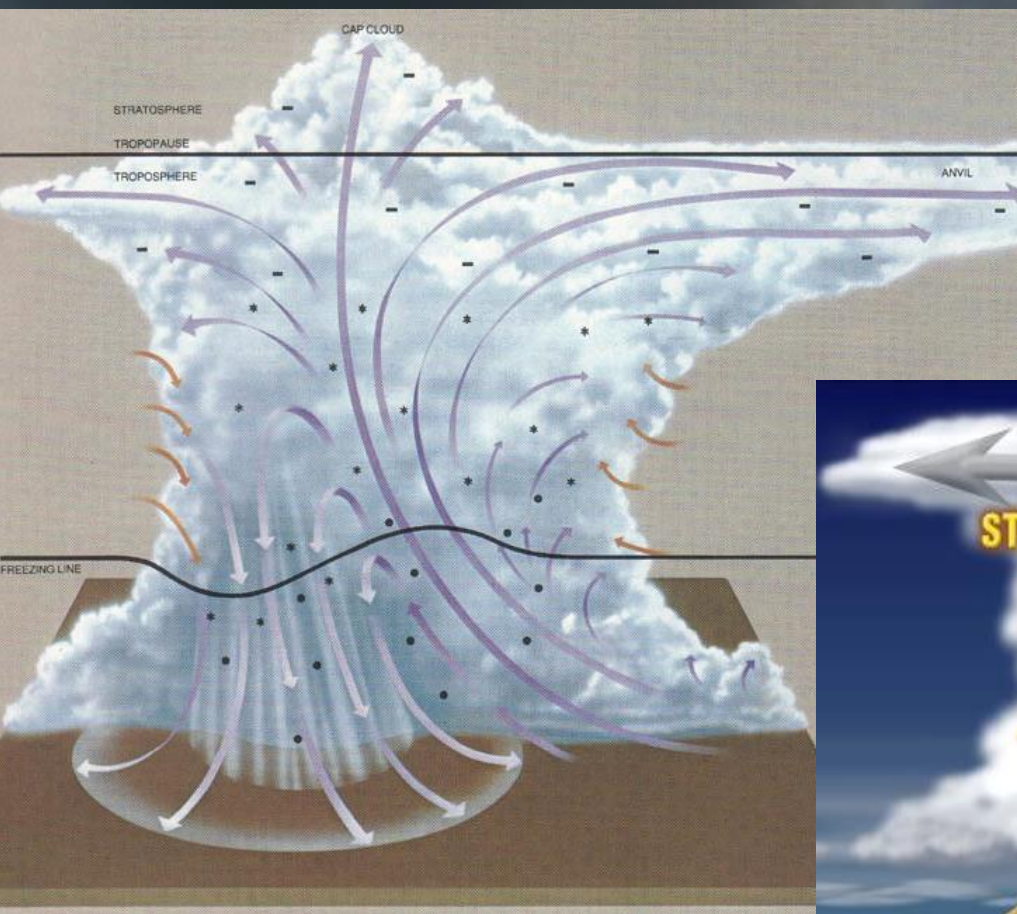
# Thunderstorms VS. Severe Thunderstorm? WIND SHEAR

**Change of wind speed and direction  
with height**



# Why Does Shear Matter in Thunderstorms

Wind shear creates violent and long lived thunderstorms.





# Severe Thunderstorms Produce Damaging Winds

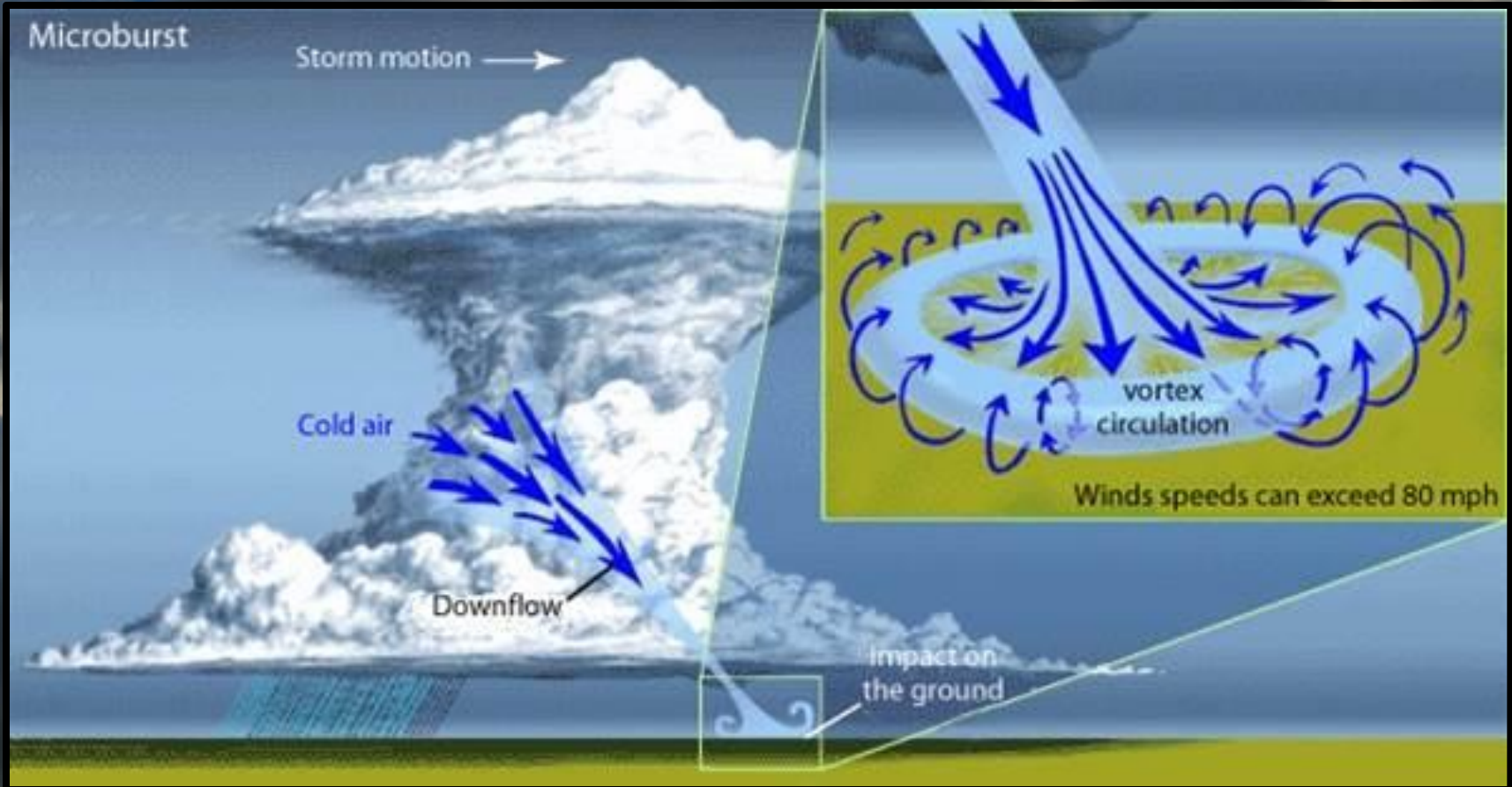
- Thunderstorm winds 58 mph or stronger may cause structural damage to buildings. Stronger winds can cause trees to uproot.
- Severe thunderstorms create life threatening conditions for recreational boaters.





# Severe Thunderstorms Can Produce Downbursts

**A powerful downward movement of air (a downdraft) in a severe thunderstorm. Winds can be as strong as 80 to 100 mph.**





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# Downbursts



**Stage 1**

**Formation**

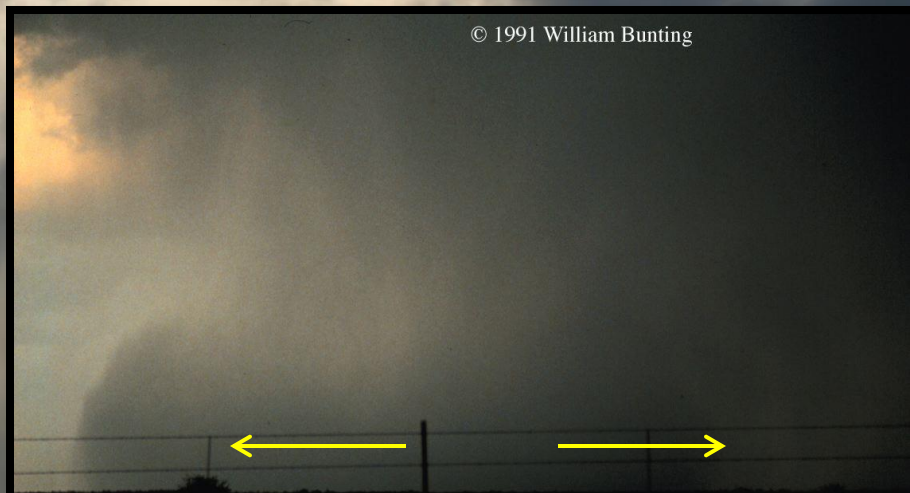
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**Stage 2**

**Impact**

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**Stage 3**

**Dissipation**

# Downburst/Microburst Damage Spreads Outwards





# Severe Thunderstorms Can Produce Large Hail



Hail causes billions of dollars in damages to crops and properties each year.

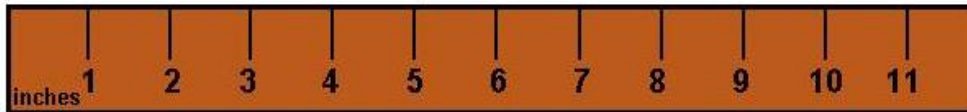


# Hail Size



The diameter of this enormous hailstone is measured to be over 5 inches!

Use hail estimation cards, rulers, calipers or loose change to measure hail.



Hail Diameter Size	Description
1/4"	Pea
1/2"	Plain M&M
3/4"	Penny
7/8"	Nickel
1" (severe)	Quarter
1 1/4"	Half Dollar
1 1/2"	Walnut/Ping Pong Ball
1 3/4"	Golf Ball
2"	Hen Egg/Lime
2 1/2"	Tennis Ball
2 3/4"	Baseball
3"	Teacup/Large Apple
4"	Grapefruit
4 1/2"	Softball
4 3/4" - 5"	Computer CD-DVD

Photo: Larry Taylor

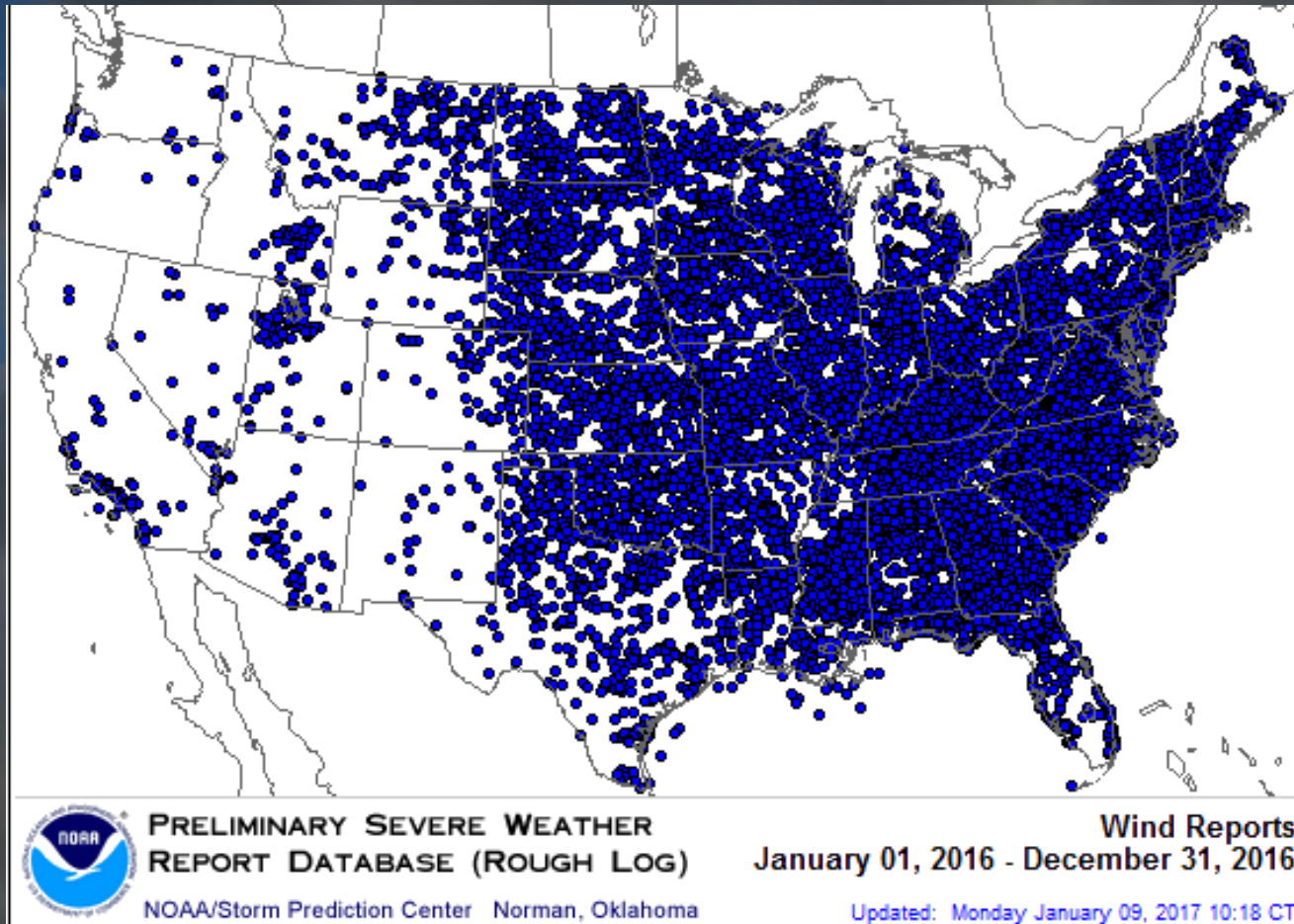


**Hail comes in many shapes and sizes. Hail can be as small as peas and as large as a computer CD-DVD. Giant hail is extremely rare and usually found in the great plains.**



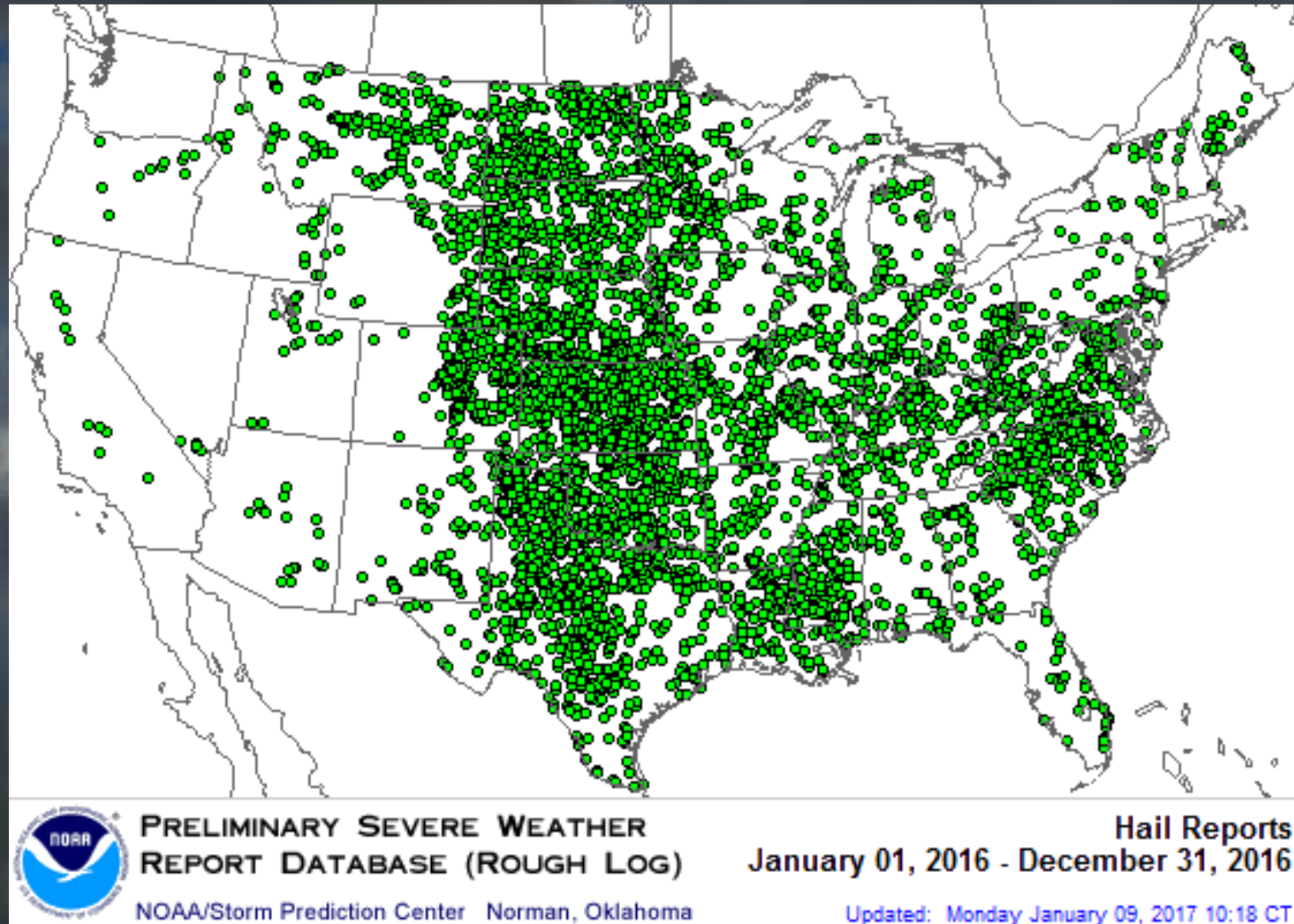
# Preliminary Severe Wind Reports in 2016

Where in the US did thunderstorms cause severe thunderstorm damage?



# Preliminary Severe Hail Reports in 2016

Where in the US did thunderstorms cause hail larger than 1 inch in diameter?





# Did You Know?



NOAA Blueprints

## WSR-88D Weather Surveillance (Doppler) Radar

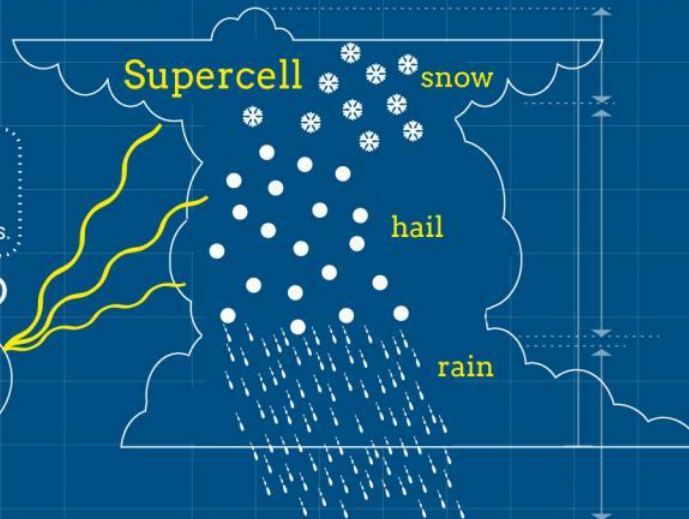
Electronics technicians maintain and calibrate the radar. Meteorologists set the scanning strategy based on weather type.

NWS Weather Forecast Office



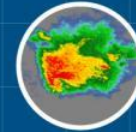
10 cm electromagnetic waves are transmitted at the speed of light in the form of short bursts of radio waves.

WSR-88D



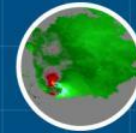
These radio waves strike hydrometeors, such as **rain**, **hail** or **snow** in the atmosphere and the wave energy is scattered in all directions. Some energy is reflected back toward the radar where a finely tuned receiver measures the amount of energy returned and whether rain/hail/snow is moving toward or away from the radar - known as the Doppler Shift.

## What can the radar tell us?



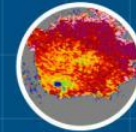
### Reflectivity

Where the rain, hail and snow is located in a thunderstorm or in other weather systems.



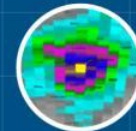
### Velocity

Detects changes in the wind inside of thunderstorms. This is used to help determine where tornadoes are forming.



### Dual-Polarization

Can be used to determine the shape of hydrometeors or other objects in the atmosphere, such as rain, hail, snow and even debris.



### Precipitation

Very good at estimating how much rain has fallen in an area.

# Watch VS. Warning

## CAUTION

- **Check the forecast often**
- **Monitor the skies**
- **Know where to take shelter**

## DANGER

- **Take shelter immediately!**
- **Seek further information**
- **Monitor the forecast**

## Watch- "Be Prepared"

Conditions are favorable for severe weather in or near the watch area. Watches are issued for tornadoes, severe thunderstorms and flash floods.

## Warning- "Take Action"

The severe weather event is imminent or occurring in the warned area. Warnings are issued for tornadoes, severe thunderstorms, flash floods and river flooding. Issued by NWS Binghamton for central New York and northeast Pennsylvania.